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High Flex Cables
Handling, Design, & Installation

This Application Note discusses the proper handling, design, and installation of high flex cables in dynamic applications, such as linear motors and moveable rotary motors. A properly-installed cable system can dramatically increase the reliability and life of power and feedback signal cables. High-quality flex cables are designed to operate for millions of cycles under ideal conditions. While most installations are never truly ideal, careful integration optimizes the life expectancies and field reliability of the cable sets.

Cabling for every moving axis should be designed for high dynamic flex operation. Many manufacturers offer flex cabling with different styles and materials suited for various operating environments. Additionally, most offer cable management accessories, such as cable clamps and tracks. Many different insulation compounds are available for various environments. For unique or harsh environments, the cable manufacturer should be consulted.

Danaher Motion's cable sets are designed for "rolling" type operation and are ideally used in a cable track or trough. These cables are not designed for S-shaped, torsional, or festoon flexure. However, they can be used in pendant type installations. For non-rolling configurations, consult Danaher Motion for recommendations.

Handling

Flex cables are prepared for installation by allowing them to relax for 24 hours in a free-hanging position from its midpoint at room temperature. These cables are ready for installation when very little memory remains. The following recommendations provide further handling guidance:

- Install in the plane of original flexure *(see Figure 1)*.

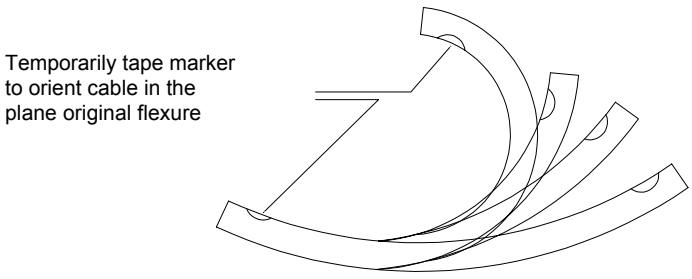

Figure 1 Determining the Plane of Original Flexure

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- Mark the ends of the cable with removable tape to help ensure proper alignment during installation.
- When working with longer lengths, cables can be looped several times (in the plane of original flexure) prior to hanging.
- Avoid stress inducers such as tying cables together or to a structure with tight fitting cable ties.

Design

Proper cable tray design or cable track selection is critical to ensure a long, trouble-free installation. A good cable guide system ensures free movement and prevents cable twisting and kinking. Cables must have adequate room inside the guide system to prevent chafing, high friction, and interference with other cables and cooling lines.

Cable Tracks

Consideration should be given to cable track configuration. Tracks that "open" and allow cables to be placed within (instead of pulled through) permit easier placement of cables with pre-installed connectors and also helps eliminate twisting and kinking during the installation process.

When cables are routed through a bulkhead or cabinet wall, consider using "cabinet seals" that allow cables with installed connectors to pass through.

Travel Length

The shortest cable track length is achieved by mounting the fixed end of the cable track in the center of the total machine travel. This length must also include over-travel and the travel of shock accumulator systems. The driven end of the cable track is attached to the slide and must be aligned vertically with the fixed end to prevent excessive noise and wear of the cable track *(see Figure 2)*.

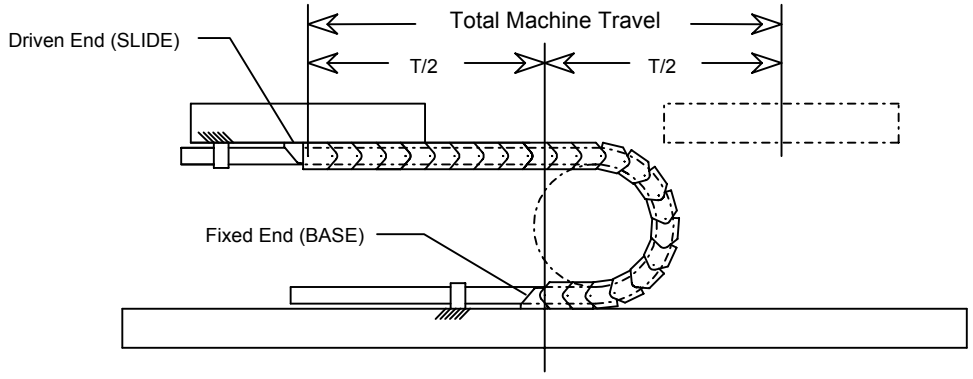

Figure 2 Cable Track Mounting Design

Cable Clearance

Dividers placed between cables (hoses) prevent crossing and interference of cables. Clearance between cables and track should be a minimum of 10-20% of the **largest** cable diameter *(see Figure 3)*. When hoses are used, the clearance calculated is made with the hoses at operating pressure.

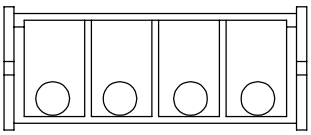

Figure 3 Clearance between Cables and Carrier (10-20%)

Cable Bend Radius

The track mounting points are designed to accommodate the minimum recommended bend radius of the largest element in the track. Consideration should be given to using the largest possible radius for the cables. Larger radii reduce stresses on the cables, ensuring longer life. **The cable supplier should always be consulted for the minimum recommended dynamic bend radius - typically 15 times the cable diameter.**

Adequate room for the cable management system in both the vertical and horizontal travel direction must be addressed to ensure proper bend radii are achieved. Placement of the cable management system should be considered as well – every effort should be made to cover or place the cable system away from process debris (chips, abrasive dust, coolant, oil, etc).

Installation

Cables (hoses) should be distributed evenly across the track with the larger (heavier) elements at the outside of the track *(see Figure 4)*. They should not be stacked on top of each other or early failure results ("twisting," "corkscrewing," and "snaking").

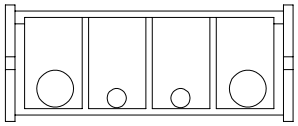

Figure 4 Symmetrical Distribution of Cables

Cables should be installed with their natural inner radius following the flexing inner radius of the track. They should not be tied to each other or to the track because these fixed points within the flexure causes localized stress and ultimate cable failure. Cables should float within the track; they should not be pulled tightly against the inner curve or pushed against the outer curve.

Cycle the cable track several times over the absolute limits of the machine to ensure that the cable management system does not interfere with structure, become constrained due to short length, or twist. Once it has been verified that the cables are free to float over the travel length, they should be clamped at both ends of the track. Minimum distance from the clamping point to the start of the bend radius must be 25 times the diameter of the largest cable (hose) used in the track *(see Figure 5)*.

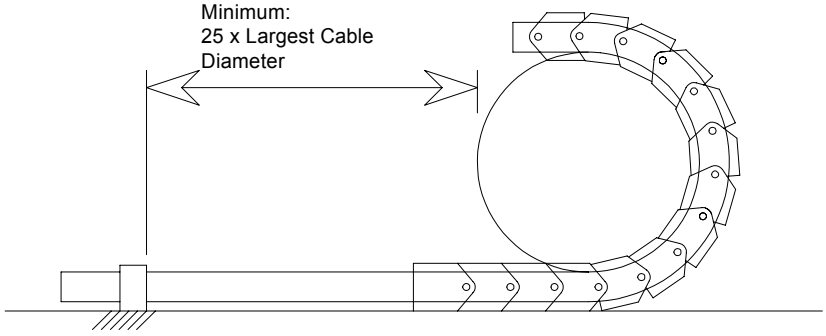

Figure 5 Clamping Distance

Be sure to locate any cable connectors or non-flex rated cables outside the cable track or flex zone.

Additional Information

Cabinet seals:
Rox Corp.
PO. Box 690177
Tulsa, OK 74169-0177
Ph: 1-800/520-4769
Fax: 1-918/254-2544
www.roxcorp.net

Cable track & clamps:
Olflex
30 Plymouth Street
Fairfield, NJ 07004-1697
Ph: 1-800/774-3539
Fax: 1-973/575-7178
www.olflex.com

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